

PATENT CLAIMS

1. A catalyst comprising at least one metal loaded on a hydrotalcite-based carrier material which has the following formula in it's uncalcined form

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wherein M^{2+} is at least one divalent metal; and M^{3+} is at least one trivalent metal;

A is an n-valent anion

n is 1 or 2,

c is 1 or 2,

and a and b are positive numbers, $a > b$;

the catalyst being prepared by:

a) addition of at least one metal salt or complex to the carrier material, of which the carrier material is (at least partly) in, or transformed to, the hydrotalcite phase during the metal addition step;

b) followed by washing, and

c) calcination.

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2. A (de)hydrogenation catalyst comprising at least one metal selected from the group VIII of the periodical table of elements loaded on a hydrotalcite-based carrier material which has the following formula in it's uncalcined form

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wherein M^{2+} is at least one divalent metal; and M^{3+} is at least one trivalent metal;

A is an n-valent anion

n is 1 or 2,

c is 1 or 2,

and a and b are positive numbers, $a > b$;

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the catalyst being prepared by:

B
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- a) addition of at least one metal salt or complex to the carrier material, of which the carrier material is (at least partly) in, or transformed to, the hydrotalcite phase during the metal addition step;
- followed by
- b) washing, and
- c) calcination.

3. The catalyst of Claim 1 or 2, wherein M^{2+} is at least one divalent metal selected from the group consisting of Mg, Ni, Zn, Fe, Co, Cu, Cr, Mn, Ru, Rh, Pd, Os, Ir, Pt; and M^{3+} is at least one trivalent metal selected from the group consisting of Al, Ga, Ni, Co, Fe, Cr, Mn, V, Ti;

A is OH and/or CO_3 ; CH_3COO ; or other inorganic or organic acid residues
n is 1 or 2.

4. The catalyst of the claims 1 - 3, wherein M^{2+} is Mg.

5. The catalyst of the claims 1 - 4, wherein M^{3+} is Al.

6. The catalyst of the claims 1 - 5, wherein M^{3+} is further Ga.

7. The catalyst of the claims 1 - 6, wherein the at least one metal salt or complex has been added in an aqueous solution.

8. The catalyst of claim 7, wherein the at least one metal salt or complex has been added in a neutral aqueous solution.

9. The catalyst of the claim 7, wherein the at least one metal salt or complex has been added in an acid aqueous solution.

10. The catalyst of the claim 9, wherein the pH of the acid aqueous solution is lower than 5, and preferably lower than 4.

11. The catalyst of the claims 9 and 10, wherein the at least one metal salt or complex has
5 been added in an aqueous inorganic acid solution.

Su b 3
12. The catalyst of the claim 11, wherein the addition of the at least one metal salt or complex has been performed in an aqueous HCl solution.

10 13. The catalyst of the claim 9 and 10, wherein the acid aqueous solution is an aqueous solution of an organic acid.

Su b 4
14. The catalyst of the claim 13, wherein the organic acid is acetic acid.

15 15. The catalyst of the claims 1 and 2, wherein the at least one metal salt or complex has been added in an organic solution.

Su b 5
16. The catalyst of claim 15, wherein the addition of the at least one metal salt or complex has been performed in an ethanol solution.

20 17. The catalyst of the claim 1 and 2, wherein the at least one metal salt or complex has been added by wet impregnation.

18. The catalyst of the claims 1-17, wherein the contact time between the metal containing
25 solution and the carrier material has been between 0.01 and 30 hours, preferably between 0.05-5 hours.

19. The catalyst of the claims 1 and 2, wherein the at least one metal salt or complex has been added by incipient impregnation.

20. The catalyst of the claims 1 - 19, wherein the hydrotalcite based carrier has been subject to preparation by mixing $Mg(NO_3)_2 \cdot 6H_2O$ and $Al(NO_3)_3 \cdot 9H_2O$ dissolved in water with a basic aqueous solution containing OH and CO_3 anions.

21. The catalyst of the claim 20, wherein the hydrotalcite based carrier has been subject to preparation as defined in the claim 1 - 20 and drying.

22. The catalyst of the claim 21, wherein the hydrotalcite based carrier has been subject to preparation and drying as defined in the claim 24 and calcination.

23. The catalyst of the claims 22, wherein the hydrotalcite based carrier has been subject to preparation, drying and calcination as defined in the claim 25 followed by suspension.

24. The catalyst of the claims 1 - 23, wherein the hydrotalcite based carrier has been subject to wet impregnation as defined in the claim 17 and anion exchange.

25. The catalyst of the claims 1 - 24, wherein the hydrotalcite based carrier has been subject to a combination of any of the treatments of the claims 20 - 24.

26. The catalyst of the claims 1 - 22, wherein the hydrotalcite based carrier has been calcined at a temperature of 700 to 1200 °C, preferably 700-800°C.

27. The catalyst of the claims 1 - 26, wherein the final catalyst calcination takes place at a temperature of 400 to 1200 °C, preferably 560-800°C.

28. The catalyst of the claims 1-27, wherein a binder is admixed.

29. The catalyst of the claims 2 - 28, wherein the hydrotalcite based carrier has been impregnated by at least one metal selected from the group VIII of the periodical table of the elements.

30. The catalyst of the claims 2 - 29, wherein the hydrotalcite based carrier has been impregnated by at least one metal selected from the group IVA of the periodical table of the elements.

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31. The catalyst of the claim 30, wherein the hydrotalcite based carrier has been impregnated by at least one metal selected from the group VIII, at least one metal selected from the group IVA, and optionally at least one metal selected from the group IA of the periodical table of the elements.

10 JLB 32. The catalyst of the claim 29, wherein the hydrotalcite based carrier has been impregnated by at least one salt or complex of Pt as the group VIII of the periodical table of the elements metal:

15 33. The catalyst of the claims 30 and 31, wherein the hydrotalcite based carrier has been impregnated by at least one salt or complex of Sn from the group IVA of the periodical table of the elements.

20 34. The catalyst of the claims 32 and 33, wherein the hydrotalcite based carrier has been impregnated by at least one salt or complex of Pt as the group VIII and by at least one salt or complex of Sn as the group IVA of the periodical table of the elements metal.

25 35. The catalyst of the claim 34, wherein the hydrotalcite based carrier has been impregnated by a salt or complex of Pt and by a salt or complex of Sn.

36. The catalyst of the claims 29, 31 and 32, wherein the salt of Pt is $H_2PtCl_6 \bullet 6H_2O$.

37. The catalyst of the claims 30 - 33, wherein the salt of Sn is $SnCl_2 \bullet 2H_2O$.

38. The use of a catalyst of any of the claims 1 - 37 in a catalytic process.

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39. The use of a catalyst of any of the claims 2 - 37 in dehydrogenation reactions.

40. The use of a catalyst of any of the claims 2 – 37 in the dehydrogenation of alkanes.

41. The use of a catalyst of any of the claims 2 – 37 in the dehydrogenation of C₂₋₄ alkanes.

5 42. The use of a catalyst of any of the claims 2 – 37 in the dehydrogenation of propane.

43. The use of a catalyst of any of the claims 2 – 37 in the hydrogenation of unsaturated hydrocarbons.

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